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A Morphometric Study of Humerus Segments

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Abstract

The humerus is a long bone in the arm, that connects the shoulder to the elbow. The present study conducted to determine the length of humerus segments, total 90 humerus(52 right and 38 were left) were used for this study. The results were, maximum length of humerus was 292.3±22.9mm on right and left was 289.45±21.8mm , the mean distances between the articular segment of the humeral head and the greater tuberosity was 6.9±1.2mm on right and 7.1±1.1mm on left, between caput humerus and callum anatomicum was 39.9±6.3mm on right and 39.1±6.1mm on left, between proximal and distal point of olecrane fossa was 38.3±1.9mm on right and 39.7±2.5mm on left, between distal part of olecrane process and trochlea of humerus was 21.2±1.8mm on right and 20.7±2.1mm on left and between proximal edge of olacrane fossa and proximal part of trochlea of humerus was 22.56±2.9mm on right and 25.72±2.9mm on right and 25.72±3.3mm on left. The knowledge of humerus segment is very important for orthopedic surgeons.

Key words - Humerus, Long bones, Forensic practice, Anthropometry.

INTRODUCTION

Anthropometry measurements are very useful to estimate stature and bone length from the skeletal remains from anthropological remnant skeletons. The very important step in assessing health and general body size trends away the given populations is stature estimated from the human skeletal remains[1] and it is also have an important role in the identification of missing persons into medical legal investigations[2], finding the mean values of different humerus segment helps in forensic and anthropometric practice. Mullar was measured five segments by using the margins of articular surfaces and key points of muscle attachment [2] these findings are very useful to determining the humerus segment. Remains of long bones of the individual is very important in anthropological practice for morphometric analysis in case of pelvis and cranium[3] and long bones such as tibia and femur of the lower limb collectively remains the best for the assessment of the living stature of the individual[4,5]. Celbis [6] stated that in case of absence of lower limb bones the estimation of living stature can be done by the help of remains of upper limb bones such as humerus, radius and ulna. In many situations the full length of long bones may not be available but only segments of bones may available in that case some methods can be used, as per as studies of Wright[3] in case of humerus segments and Mysorekar`s[7] two studies in case of radius, ulna, femerus and tibia. Depending on Munoz et al [8] study we can find out the total humerus length by a remains of humerus segment, for estimating of sex from whole skeletal or remains. There are two methods qualitative morphological examination remains the quickest and easiest method and in experienced scientists results in95-100% accuracy [9]. In terms of repeatability, data evolution, objectivity and applicability to both cranial and post cranial the morphometric methods are most considered [10]. Many studies were confirmed the humerus by using classical osteometric techniques, the humerus is one of the strongest long bones of the skeleton which even in a fragmented state is likely to be recorded in a forensic case[11]. The present study is conducted for morphometric analysis of humerus segments.

MATERIALS AND METHODS

90 dry adult human humeruses constituted the material for the present study. The Humeruses skulls belong to the Karantaka region, India. Each was studied for the humerus segmental morphometric analysis. The following measurements were observed for this study.

- Maximum length of humerus
- Mean distances between the articular segment of the humeral head and the greater tuberosity of humerus
- Mean distance between caput humerus and callum of humerus
- Mean distance between proximal and distal point of olecrane of humerus
- Mean distance between distal part of olecrane process and trochlea of humerus
- Mean distance between proximal edge of olacrane fossa and proximal part of trochea of humerus.

RESULTS

The present study conducted to determine the length of humerus segments, total 90 humerus(52 right and 38 were left) were used for this study.

The results were, maximum length of humerus was 292.3±22.9mm on right and left was 289.45±21.8mm.

The mean distances between the articular segment of the humeral head and the greater tuberosity was 6.9±1.2mm on right and 7.1±1.1mm on left.

Table. 1 The measurements of five different segments of humerus

	Parameter	Right	Left
1	Maximum length of humerus	292.3±22.9mm	289.45±21.8mm
2	The mean distances between the articular segment of the humeral head and the greater tuberosity	6.9±1.2mm	7.1±1.1mm
3	The mean distances between caput humerus and callum anatomicum	39.9±6.3mm	39.1±6.1mm
4	The mean distances between proximal and distal point of olecrane fossa	38.3±1.9mm	39.7±2.5mm
5	The mean distances between distal part of olecrane process and trochlea of humerus	21.2±1.8mm	20.7±2.1mm
6	The mean distances between proximal edge of olacrane fossa and proximal part of trochlea of humerus	25.72±2.9mm	22.56±2.9mm

The mean distances between caput humerus and callum anatomicum was 39.9±6.3mm on right and 39.1±6.1mm on left.
The mean distances between proximal and distal point of olecrane fossa was 38.3±1.9mm on right and 39.7±2.5mm on left.
The mean distances between distal part of olecrane process and trochlea of humerus was 21.2±1.8mm on right and 20.7±2.1mm on left.
The mean distances between proximal edge of olacrane fossa and proximal part of trochlea of humerus was 22.56±2.9mm on right and 25.72±2.9mm on right and 25.72±3.3mm on left(Table 1).

DISCUSSION

One of the longest bone in the human boby is humerus belongs to upper limb, in forensic and anthropological practice it plays very important role because of it important to identify the its length from the segmental measurements [12] this method is an essential step in assessing health, sexual dimorphism and the general body size that trends among the past populations [1]. According to study of France [13] morphometry of distal segments of humerus is very important because of its sexual dimorphism and humerus is subjected to greater functional stress. Researchers agree that epiphyseal structure tend to be more dimorphic than long [14, 15]. According to previous studies we can note that the best discriminatory measurement varies in different samples. The studies of Guatamel [16], China [17], Germany [18], South Africa [19], Japanese [20] and Thai [17] population confirmed that distal pat of humeurs is more effective than proximal part. According Kranito et al [21] study of Cretan population data is concludes that proximal epiphysis is the most dimorphic part with classification accuracy of 89.9% while the distal epiphysis is ranked third among with length 85.1% and same study proved that men have shorter humerus shaft than women humerus shaft.
Lague et al[22] showed in his study result for sexual dimorphism in humerus morphometry. It was showing that sexes of the American whites and African-Americans a mixed pattern of affinities with the males of each group to be closer in shape to the females of the other group.
According to different studies the mean value of the maximum humerus length were 309.6±20.6mm and 299.6±22.5mm[23], 374±2.44mm and 370±2.01mm[24] on the right and left in Indian populations, 307.1± 20.6 and 304 ± 18.9mm in Turkish population[25]. The mean distance from the most proximal point on the articular surface of the head of the humerus to the distal point on surgical neck of humerus was 37.14±4.82mm on right and 37.14±4.45mm on the left in Indian populations [23], 41.0 ± 5.1 mm and 40.9 ± 3.9 mm on the right and left side respectively in Turkish population [25], 32.8 ± 2.7 mm in study of Zvere [26]. The mean distance between highest point on the articular segment of the head of the humerus and most proximal point on the greater tuberosity was 5.95±1.18mm and 5.83±1.57mm on right and left respectively [23], 6 to 8 mm in study of Green [27]. The distance between the proximal and distal edge of olecranon fossa was 20.14±3.43mm and 19.06±2.92mm right and left respectively in Indian populations [23], 24.2 ± 2.07 mm and 23.9 ± 2.63 mm in Turkish population [25], 20.2 ± 1.9mm in females and in males as 20.3 ± 1.3 mm in study of Churchill [28]. The distance between the distal margin of the olecranon fossa and trochlea was 17.37±3.36mm and 16.82±2.20mm on right and left respectively, on the right humerus it was 14.2 ± 1.8mm for males in study of Wright [2]. The distance from the proximal margin of the olecranon fossa to the distal trochlea was 37.26 ± 4.71 mm on right and 35.72 ± 4.30 mm on left in Indian population [23]. In previous studies authors did not analyze possible differences among population related to relationship between total humeral length and the measurements of their segments. Nath[3] method appreciated for regression analysis to define relationships between length of long bones and living height of individuals and as well as between the length of bones fragments and their maximum length according to Steele[29] the height of living individuals is variable measurements may be influenced by different factors such as ethnicity, age, sex, race and culture. The knowledge of humerus segment is very important for orthopedic surgeons, anthropologists and forensic practice.

REFERENCES

1. Hoppa RD, Gruspier KL. Estimating the diaphyseal length from fragmentary subadult skeletal remains: implications for palaeodemographic reconstructions of a southern Ontario ossuary. American Journal of Physical Anthropology. 1996; 100(3): 341-354.
2. Wright LE, Vasquez MA. Estimation the length of incomplete long bones: Forensic standards from Guatemala. Am J Phys Anthropol 2003;120: 233- 251.
3. Nath S, Badkur P. Reconstruction of stature from long bone lengths. Int. J. Osteoarchaeol. 2002;1:109-14.
4. De Mendonça, M. C. Estimation of height from the length of long bones in a Portuguese adult population. Am. J. Phys. Anthropol. 2000; 112(1):39-48.
5. Radoinova D, Tenekedjiev K, Yordanov Y. Stature estimation from long bone lengths in Bulgarians. Homo. 2002;52(3):221-32.
6. Celbis O, Agritmis, H. Estimation of stature and determination of sex from radial and ulnar bone lengths in a Turkish corpse sample. Forensic Sci. Int. 2006;158(2-3):135-9.
7. Mysorekar V. L, Verrma P. K, Mandedkar A. N, Sarmat T. C. Estimation of stature from parts of bones--lower end of femur and upper end of radius. Med. Sci. Law. 1980;20(4):283-6.
8. Munoz J.I, Linares Iglesias M, Suarez Penaranda J.M, Mayo M, Miguens X, Rodríguez Calvo M.S, Concheiro L. Stature estimation from radiographically determined long bone length in a Spanish population sample. Forensic Sci Int. 2001;46(2):363- 6.
9. Krogman W. M, Iscan M. Y. The Human Skeleton in Forensic Medicine. Springfield, Charles C. Thomas, 1986.
10. Walrath D.E, Turner P, Bruzek J. Reliability test of the visual assessment of cranial traits for sex determination, Am. J. Phys. Anthropol. 2004;125; 132–137.
11. Albanese J, Cardoso H.F.V, Saunders S.R. Universal methodology for developing univariate sample-specific sex determination methods: an example using the epicondylar breadth of the humerus, J. Arch. Sci. 2005;32:143–152.
12. Williams P. L, Warwick R, Dyson M, Bannister L. H. The humerus. In: Gray's anatomy. 37th Ed. Edinburgh, Churchill Livingstone, 1989;406p.
13. France D.L. Sexual dimorphism in the human humerus, Ph.D. Dissertation, Boulder, University of Colorado, 1983.
14. Sakaue K. Sexual determination of long bones in recent Japanese, Anthropol. Sci. 2004;112 ;75–81.
15. Bookstein F, Schafer K, Prossinger H, Seiderl H et al. Comparing frontal cranial profiles in archaic and modern homo by morphometric analysis, Anat. Record. 1999;257:217–224.
16. Frutos L. Metric determination of sex from the humerus in a Guatemalan forensic sample, Forensic Sci. Int. 2005;147:153–157.
17. Iscan M.Y¸ Loth S.R, King C.A, Shihai D, Yoshino M. Sexual dimorphism in the humerus: A comparative analysis of Chinese, Japanese and Thais, Forensic Sci. Int. 1998;98;17–29.
18. Mall G, Hubig M, Buttner A, Kuznik J, Penning R, Graw M. Sex determination and estimation of stature from the long bones of the arm, Forensic Sci. Int. 2001;117 :23–70.
19. Steyn M., Iscan M.Y. Osteometric variation in the humerus: sexual dimorphism in South Africans, Forensic Sci. Int. 1999;106 :77–85.
20. Sakaue K. Sexual determination of long bones in recent Japanese, Anthropol. Sci. 2004;112: 75–81.
21. Kranioti E.F, Vorniotakis N, Galiatsou C, Iscan M.Y, Michalodimitrakis M. Sex identification and software development using femoral radiographs, in: Balkan Academy of Forensic Sciences, 5th Meeting, 2007, 80p.
22. Leung KS, Procter P, Robioneck B, Behrens K. Geometric mismatch of the Gamma nail to the Chinese femur. Clin Orthop Relat Res 1996;323: 42-8.
23. Somesh M. S, Latha V, Prabhu Shilpa K, Mangala M, Ashwin Krishnamurthy B. V, Murlimanju. Morphometric Study of the Humerus Segments in Indian Population. Int. J. Morphol. 2011;29(4):1174-1180.
24. Udaya K, Sarala Devi K V, Shridhar J. Regression Equation for Estimation of Length of Humerus from its Segments: A South Indian Population Study. Journal of Clinical and Diagnostic Research. 2011;5(4): 783-786.
25. Akman SD, Karakas P, Bozkir MG. The morphometric measurements of humerus segments. Turk J. Med Sci. 2005; 36: 81-5.
26. Zverev Y, Chisi, J. Estimating height from arm span measurement in Malawian children. Coll. Antropol. 2005;29(2):469-73.
27. Green A, Izzi J. Isolated fractures of the greater tuberosity of the proximal humerus. J. Shoulder Elbow Surg. 2003;12(6):641-9.
28. Churchill S. E, Smith F. H. A modern human humerus from the early Aurignacian of Vogelherdh.le (Stetten, Germany). Am.J. Phys. Anthropol. 2000;112(2):251-73.
29. Steele D. G, Mckern T. W. A method for assessment of maximum long bone length and living stature from fragmentary long bones. Am. J. Phys. Anthropol. 1969;31(2):215- 27.